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ABSTRACT

This publication provides suggested learner outcomes for guiding instruction and evaluation of students in grades 9-12 in Oklahoma. The goals are intended to provide teachers, administrators, school boards, parents, and other concerned citizens with a clear understanding of expected minimum learner outcomes for each mathematics course. Teachers are encouraged to surpass and extend the listed objectives. Outcomes are listed for each of the following courses: (1) general mathematics; (2) consumer math; (3) algebra I; (4) geometry; (5) algebra II; (6) trigonometry; (7) math analysis; and (8) calculus. (RH)

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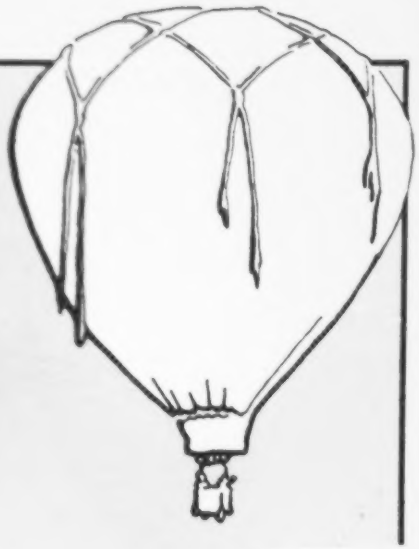
Suggested Learner Outcomes

Grades 9 - 12



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MATHEMATICS

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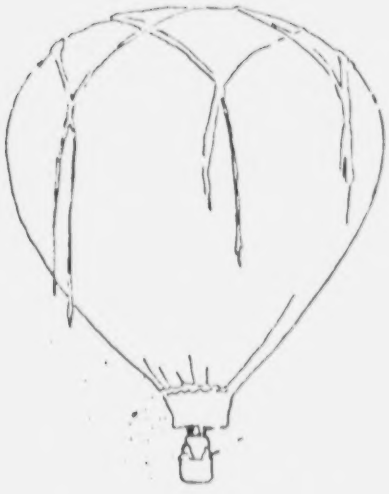

MATHEMATICS

Oklahoma State Department of Education
John M. Folks, State Superintendent
Oklahoma City, Oklahoma
July, 1985

Foreword

During the academic year 1983–84 the Oklahoma State Department of Education began the process of producing standardized suggested learner outcomes in the five areas of Language Arts, Science, Math, Reading and Social Studies for grades 1 through 8. The goal was to have some stated objectives upon which teachers and administrators could build a solid curriculum which would ultimately provide a better education for the students of Oklahoma.

This process was continued during the 1984–85 year in the same five subject areas for grades 9 through 12. Secondary school foreign language learner outcomes were also devised for Spanish, French, German and Latin. Dozens of persons participated in the process and in June 1985 a second large group of teachers and administrators met to validate the learner outcomes. The booklet you have in your hand is the result of all this effort and we sincerely hope that it will be of assistance as you plan for effective teaching and learning in the classroom.

John M. Folks

John M. Folks
State Superintendent

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Special Thanks to

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Victor Van Hook, Assistant State Director Educational Services
State Department of Vocational and Technical Education

ACKNOWLEDGEMENTS

Judy Leach
Associate Superintendent of Instruction

J.D. Giddens
Assistant Superintendent, Instruction Division

Leonard Bates
Executive Director, Curriculum Services

Mary Reid
Administrator, Curriculum Section

Susan Gay
Math Specialist

COMMITTEE CHAIRMAN

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Math Specialist, Curriculum Section

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INTRODUCTION

The suggested learner outcomes in this document are offered as a positive contribution toward excellence in instruction and student achievement by providing guidelines for the mathematics curriculum in the state of Oklahoma. The suggested goals are intended to provide teachers, administrators, school boards, parents, and other concerned citizens with a clear understanding of expected learner outcomes for each mathematics course.

The listed goals identify a portion of the outcomes that may be achieved by students in a particular course. Teachers are encouraged to surpass and extend the listed objectives. Curriculum supervisors and textbook writers are encouraged to utilize this document to help provide quality mathematics instruction for all Oklahoma students.

PHILOSOPHY

Every young person in Oklahoma has an opportunity to receive an education. Students will be provided a chance to study mathematics as a body of knowledge used to communicate patterns and relationships. The skills involved in solving problems should be emphasized. Basic problem-solving processes such as the collection and organization of data, pattern recognition, inference and deduction, estimation and verification should be fundamental concepts in the mathematics curriculum. An understanding of mathematical structures and the processes used to develop those structures are essential as students develop the ability to transfer classroom theory and practice into applications in a real setting.

In addition to the knowledge of basic concepts and processes, all students need to be challenged and guided toward achieving their intellectual potential. They should be encouraged to explore and study higher mathematics. The influence of the teacher can be a significant factor as students continue to develop attitudes toward mathematics and academic achievement.

Professional educators have an opportunity to provide guidance for the future direction of school mathematics. The following are recommendations formulated by the National Council of Teachers of Mathematics[1] based on information gathered in a nationwide survey of public school mathematics teachers, mathematics supervisors, college mathematics teachers, principals, school board members and parent-teacher organizations.

1. Problem solving should be the focus of school mathematics.
2. Basic skills in mathematics should be defined to encompass more than computational facility.
3. Mathematics programs should take full advantage of the power of calculators and computers at all grade levels.
4. Stringent standards of both effectiveness and efficiency should be applied to the teaching of mathematics.
5. The success of mathematics programs and student learning should be evaluated by a wider range of measures than conventional testing.
6. More mathematics study should be required for all students and a flexible curriculum with a greater range of options should be designed to accommodate the diverse needs of the student population.
7. Mathematics teachers should demand of themselves and their colleagues a high level of professionalism.
8. Public support for mathematics instruction should be raised to a level commensurate with the importance of mathematical understanding to individuals and society.

These recommendations can serve as guidelines in the development of mathematics curriculum in Oklahoma.

Because of the increasing importance of mathematics in a technological society, excellence in achievement by every student must be in the goal of education. It is with a commitment to quality mathematics instruction and improved student achievement that these suggested learner outcomes are offered.

[1]Reprinted with permission. "An Agenda for Action: Recommendations for School Mathematics of the 1980's, NCTM, 1980.

GENERAL MATHEMATICS

General Mathematics, Basic Mathematics, High School Arithmetic, and other courses with similar titles are to include these suggested learner outcomes.

While a body of content is suggested, each teacher will find it necessary to modify concepts and extend the topics to meet the individual needs of students. Teachers are encouraged to introduce additional concepts which could be used in subsequent or related courses. The appropriate use of Computer Assisted Instruction (CAI) is recommended.

GM.1 The student will round numbers.
Descriptive Statement: Numbers may extend to the millions place for whole numbers and the ten thousandths place in decimal notation.

GM.2 The student will identify and define mathematical terminology used in the basic operations.
Descriptive Statement: The words will include sum, difference, product, quotient, factor, multiple, denominator, and numerator.

GM.3 The student will identify the place value of each digit in a given numeral and write numerals using standard, expanded, and scientific notation.
Descriptive Statement: Changing from one type of notation to another will be included.

GM.4 The student will read and write the word names for numbers.
Descriptive Statement: Numbers may extend to the millions place for whole numbers and the ten thousandths place in decimal notation.

GM.5 The student will use order of operations to solve simple numerical expressions.

GM.6 The student will add, subtract, multiply, and divide whole numbers, fractions, and decimals.

GM.7 The student will solve word problems involving whole numbers, decimals, and fractions.
Descriptive Statement: Selecting the appropriate operation(s) for solution and translating word phrases and sentences into mathematical expressions and equations will be required.

GM.8 The student will compare whole numbers, decimals, and fractions using the symbols $<$, $>$, and $=$.
Descriptive Statement: The symbol $< >$ may be introduced.

GM.9 The student will identify a whole number as prime or composite, find the factors of a number and write the prime factorization of a composite number.
Descriptive Statement: Divisibility tests for 2, 3, 5, 6, 9, and 10 will be used. Prime factorization may be written using exponents.

GM.10 The student will read and write the word names for fractions and mixed numerals.

GM.11 The student will name the fractional equivalent for a given fraction or mixed numeral.
Descriptive Statement: Simplifying fractions and renaming improper fractions as mixed numerals and vice versa will be included. The student will also identify the greatest common factor (GCF) and the least common multiple (LCM).

GM.12 The student will identify and name basic geometric terms and figures.
Descriptive Statement: Point, line, plane, angle, line segment, and ray will be included.

GM.13 The student will draw basic geometric figures and identify parallel lines and perpendicular lines.
Descriptive Statement: A straight edge and a protractor will be used to draw the basic geometric figures.

GM.14 The student will classify angles and pairs of angles.
Descriptive Statement: A protractor will be used to measure angles to determine which are acute, right, obtuse, and straight. Complementary, supplementary, and vertical angles will be included.

GM.15 The student will recognize and classify polygons.
Descriptive Statement: Triangles will be classified by the measure of sides and angles. Quadrilaterals will be classified by specific properties.

GM.16 The student will identify the parts of a circle and calculate the circumference and area of a circle.
Descriptive Statement: Radius and diameter will be included.

GM.17 The student will identify the characteristics of various quadrilaterals and calculate the area and perimeter of a given quadrilateral.
Descriptive Statement: The square, rectangle, rhombus, parallelogram, and trapezoid will be included.

GM.18 The student will calculate the volume of a simple solid.
Descriptive Statement: Cylindrical and rectangular solids may be included.

GM.19 The student will identify the parts of a right triangle and utilize the Pythagorean relationship.
Descriptive Statement: The legs and hypotenuse will be identified. Given the length of two sides, the Pythagorean Theorem will be used to determine the length of the third side.

GM.20 The student will use the English and metric systems of measurement.
Descriptive Statement: Selection of an appropriate unit measurement, conversion from one unit to another within the same system, and solving practical problems involving measurement will be included.

GM.21 The student will demonstrate an understanding of time.
Descriptive Statement: A given number of minutes will be written as a fractional part of an hour. The elapsed time between two different times in a given day will be calculated. Computing time problems may be performed which involve different time zones.

GM.22 The student will identify the ordered pair associated with a point, and graph and label points associated with ordered pairs in all four quadrants.

GM.23 The student will express a ratio as a fraction in simplest form, compare ratios, and solve problems using proportions.

GM.24 The student will convert fractions, decimals, and percents to equivalent expressions.
Descriptive Statement: Fractional numerals will include proper and improper fractions and mixed numerals.

GM.25 The student will solve percent problems.
Descriptive Statements: Methods may include using proportions and decimal or fractional equivalents. Application problems may include sales tax, discount, interest, and commission.

GM.26 The student will compare integers and perform basic operations with integers.
Descriptive Statement: The symbols <,>, and = may be used.

GM.27 The student will find the square and square root(s) of a number.
Descriptive Statement: Methods may include the square root algorithm, estimation, a square root table, and a calculator.

GM.28 The student will find the mean, mode, median, and range of a set of numbers.

GM.29 The student will interpret graphs and will construct graphs from given data.
Descriptive Statement: Line, bar and circle graphs will be used.

GM.30 The student will make and count change.

CONSUMER MATH

Although the concepts appear in some logical instructional sequence, it is recognized that sequencing of concepts will be at the discretion of the instructor. The listed outcomes are only a portion of the curriculum, and the teacher is encouraged to surpass them.

The application of basic mathematical skills is a goal in this course. Practice with these skills can be incorporated into the first fifteen learner outcomes. In Consumer Mathematics it is desirable that the student have access to a calculator. The appropriate use of Computer Assisted Instruction (CAI) is recommended.

CM.1 The student will compute individual gross earnings based on given information.
Descriptive Statement: Problems will include overtime, fixed salaries, commissions, bonuses, fees, tips, interest, dividends, pensions, and price/unit work.

CM.2 The student will calculate net earnings when given gross earnings and withholdings.
Descriptive Statement: Problems will include FICA, Federal and state income taxes, and other withholdings such as union dues, health insurance and retirement.

CM.3 The student will complete Federal and Oklahoma income tax returns.
Descriptive Statement: Facsimiles of Federal and Oklahoma tax forms, tax tables and a complete W-2 form will be provided. (A packet containing all necessary forms and other pertinent information is available from the IRS).

CM.4 The student will find the actual cost involved in purchasing an automobile.
Descriptive Statement: Problems will include calculating the amount to be paid to the dealer, taxes, insurance coverage, miscellaneous and registration fees, and cost of financing a car loan.

CM.5 The student, given a specific situation, will determine the fixed and flexible costs of owning operating an automobile.

CM.6 The student will compare methods of transportation.
Descriptive Statement: The opportunity will be given to contrast and compare the prices of travel. Modes of travel may include private automobiles, buses, trains, airplanes, and car rentals.

CM.7 The student will complete a sequence of problems that involve skills in reading maps, charts, and timetables.

CM.8 The student will complete transactions related to bank accounts.
Descriptive Statement: Transactions will include opening an account, writing a check, completing a check stub or a register, filling out deposit slips, and reconciling a bank statement. Interest problems will be included.

CM.9 The student, given a specific situation, will interpret insurance information and calculate cost.
Descriptive Statement: Insurances will include life, health, fire, accident and property.

CM.10 The student will calculate the cost of consumer credit.
Descriptive Statement: Problems will involve installment buying, credit cards, and loans from lending institutions.

CM.11 The student will solve problems involving income and expenses.
Descriptive Statement: A budget may be prepared on the cost of housing, clothing, food, and other miscellaneous expenses.

CM.12 The student will determine the amount of sales and excise tax for a given purchase.

CM.13 The student will find the property tax based on an assessed valuation at a given tax rate.

CM.14 The student will recognize investment opportunities.
Descriptive Statement: Investments will include stocks, bonds, mutual funds, and saving certificates.

CM.15 The student will read and compute billing data associated with gas, water and electric meters.
Descriptive Statement: Problems will include figuring units used and cost from one billing period to the next.

CM.16 The student will demonstrate a proficiency in basic mathematical skills.
Descriptive Statement: Basic mathematical skills will include addition, subtraction, multiplication, and division of whole numbers, decimals, and fractions. Percent, ratio, and proportion problems will be included.

ALGEBRA I

Although the concepts appear in some logical instructional sequence, it is recognized that sequencing of concepts will be at the discretion of the instructor. The listed outcomes are only a portion of the curriculum, and the teacher is encouraged to surpass them.

ALI.1 The student will add, subtract, multiply, and divide integers.

ALI.2 The student will evaluate numerical and algebraic expressions.
Descriptive Statement: Numerical expressions will involve grouping symbols, absolute value, exponents, and order of operations. Algebraic expressions will be evaluated for given replacements of the variable(s).

ALI.3 The student will write algebraic expressions to represent word phrases and sentences.

ALI.4 The student will identify examples of properties of real numbers.
Descriptive Statement: The properties will include the commutative and associative properties for multiplication and addition, distributive property, additive and multiplicative identity and inverse properties, and multiplicative property of zero.

ALI.5 The student will perform operations involving whole number exponents.
Descriptive Statement: The laws of exponents will be used to simplify expressions.

ALI.6 The student will simplify square root expressions.

ALI.7 The student will add, subtract, multiply, and divide polynomials.
Descriptive Statement: For addition and subtraction, each polynomial will have no more than four terms. In multiplication the total number of terms in the two polynomials will not exceed five. In division the numerator and denominator will be factorable if they contain more than two terms.

ALI.8 The student will determine the greatest common factor and least common multiple of two or more numerical and algebraic terms.

ALI.9 The student will factor binomials and trinomials.
Descriptive Statement: Polynomials will include first and second degree binomials and trinomials in one or two variables. Polynomials will have integral coefficients.

ALI.10 The student will add, subtract, multiply, and divide rational expressions.

ALI.11 The student will solve linear polynomial equations in one variable with rational coefficients.
Descriptive Statement: Solving the equation may involve the use of addition, subtraction, multiplication, and division properties.

ALI.12 The student will solve linear inequalities in one variable with integral coefficients.
Descriptive Statement: Graphing the solution set on a number line will be included.

ALI.13 The student will use factoring to solve quadratic equations with one variable and integral coefficients.

ALI.14 The student will solve equations containing rational expressions.
Descriptive Statement: Quadratic equations should be factorable.

ALI.15 The student will graph linear equations in two variables on a coordinate plane.

ALI.16 The student will solve systems of linear equations in two variables graphically and algebraically.
Descriptive Statement: Algebraic solutions will require solving the systems using the addition or substitution method.

ALI.17 The student will determine the slope of a line when given an equation of the line, the graph of the line, or two points on the line.

ALI.18 The student will solve problems using algebraic concepts.
Descriptive Statement: Problems will involve perimeter and area of rectangles, proportions, rate and mixture, money, simple interest, and distance.

GEOMETRY

The study of geometry helps the student develop logical reasoning skills. The application of geometric concepts in problem-solving situations provide the student with an awareness of the usefulness of geometry.

Although the concepts appear in some logical instructional sequence, it is recognized that sequencing of concepts will be at the discretion of the instructor. The listed outcomes are only a portion of the curriculum, and the teacher is encouraged to surpass them.

G.1 The student will demonstrate a knowledge of undefined terms, basic definitions, and measurement.

G.2 The student will demonstrate a knowledge of relationships and apply theorems about special pairs of angles.
Descriptive Statement: Pairs of angles will include adjacent angles, supplementary and complementary angles, vertical angles, and angles formed by perpendicular lines. Angle bisectors will also be included. Linear pairs of angles may be included.

G.3 The student will demonstrate a knowledge of conditional statements.
Descriptive Statement: Skills will include recognizing a hypothesis and conclusion and identifying the converse, inverse, and contrapositive. Stating a conditional using "if...then" form will also be included.

G.4 The student will write deductive proofs.

G.5 The student will demonstrate a knowledge of corresponding parts of congruent triangles.
Descriptive Statement: This should involve the meaning of congruence, deduced information about segments and angles in congruent triangles, and theorems and corollaries about isosceles triangles and overlapping triangles.

G.6 The student will demonstrate a knowledge of the relationships of lines and planes.
Descriptive Statement: Lines may be in the same plane or in space.

G.7 The student will apply theorems and postulates about parallel lines and transversals.

G.8 The student will recognize and classify polygons.
Descriptive Statement: The student will name polygons and determine the sum of the angles of a convex polygon. Triangles will be classified by the measures of sides and angles. The relationship of the exterior and interior angles of a polygon will be included.

G.9 The student will demonstrate a knowledge of congruent polygons.
Descriptive Statement: Definitions, properties of quadrilaterals and other polygons, and related proofs will be included.

G.10 The student will use the inequality relations.
Descriptive Statement: Inequalities involving the angles of a triangle and the sides of a triangle will be included.

G.11 The student will state and apply the properties of similar polygons.
Descriptive Statement: Setting up and solving a proportion will be included.

G.12 The student will recognize and distinguish between deductive and inductive reasoning.

G.13 The student will identify relationships in right triangles.
Descriptive Statement: This should include the Pythagorean Theorem and finding geometric means. The relationship of the sides in 30-60-90 and 45-45-90 triangles will be included.

G.14 The student will use the trigonometric ratios to solve problems involving right triangles.

G.15 The student will identify the parts of a circle and their relationships and recognize circumscribed and inscribed polygons.
Descriptive Statement: Circles, spheres, theorems and properties involving arcs, central angles, inscribed angles, tangents, radii, chords, and secants should be included.

G.16 The student will acquire a knowledge of constructions and locus problems.
Descriptive Statement: Basic constructions with a straight edge and compass will be included. These constructions may be used in original construction exercises and to find special points of concurrency.

G.17 The student will demonstrate a knowledge of perimeter and area of special polygonal regions.
Descriptive Statement: The relationship of scale factors and the perimeter and area of similar figures will be included.

G.18 The student will find the circumference and area of a circular region and compute arc lengths and the area of a sector of a circle.

G.19 The student will find the areas and volume of a solid.
Descriptive Statement: Solids may include prisms, pyramids, cylinders, cones, and spheres. Lateral area and total area may be computed.

G.20 The student will use the slope, distance, and mid-point formula to solve problems.

ALGEBRA II

Algebra II is both a review and extension of basic algebraic concepts introduced in a first-year course. From prerequisite courses, the teacher should determine which concepts have not been mastered and direct the review toward proficiency in those skills. The teacher's responsibility is to expand the course to include an emphasis on applications, an enrichment of basic concepts, and an introduction of additional concepts which will be developed in subsequent courses in mathematics.

A rigorous course in Algebra II would include all of the following topics. A study that must be limited to fewer topics should include all starred items as a minimum.

Although the concepts appear in some logical instructional sequence, it is recognized that sequencing of concepts will be at the discretion of the instructor. The listed outcomes are only a portion of the curriculum, and the teacher is encouraged to surpass them.

***ALII.1** The student will demonstrate a knowledge of the basic concepts of the real number system.
Descriptive Statement: Identification and use of the axioms of the real number system in algebraic proofs will be included. Operations with real numbers and simplification of numerical expressions will be reviewed.

***ALII.2** The student will solve first degree equations and inequalities in one variable.
Descriptive Statement: The solution of complex sentences and sentences containing absolute value will be included. Emphasis will be on practical application problems. The Fundamental Theorem of Algebra will be included.

***ALII.3** The student will recognize and graph linear equations and inequalities on a Cartesian coordinate plane.

***ALII.4** The student will write the equation of a line in general linear form.
Descriptive Statement: The line may be defined by its graph, a point and slope, or two points on the line.

***ALII.5** The student will recognize linear functions and use related terminology and notation.

***ALII.6** The student will solve systems of linear equations and inequalities and apply them to solve practical problems.
Descriptive Statement: The systems will include equations in two and three variables. Methods of solution may involve graphing in two dimensions, linear combinations, substitution, and determinants. The concept of linear programming may be included.

***ALII.7** The student will simplify algebraic expressions and perform the four basic operations on polynomial expressions.
Descriptive Statement: Basic laws of exponents will be reviewed. Zero and negative exponents will be included. The Binomial Theorem may be applied in the expansion of powers of binomials.

***ALII.8** The student will factor polynomial expressions completely.
Descriptive Statement: Methods will include identifying the greatest common factor, special product formulas, quadratic trinomials, and synthetic division.

***ALII.9** The student will solve second degree equations in one variable.
Descriptive Statement: Methods will include factoring, completing the square and the quadratic formula. Solutions will include both rational and irrational roots. Higher degree equations will be included and solved by factoring. The student will use the discriminant to determine the nature of the roots of quadratic equation.

***ALII.10** The student will simplify and perform the four basic arithmetic operations with complex rational expressions and solve fractional equations.
Descriptive Statement: Application problems will include work and mixture problems.

***ALII.11** The student will solve direct, inverse, joint, and combined variation problems.
Descriptive Statement: Application problems will be included.

***ALII.12** The student will simplify radical terms, perform the four basic operations with radical terms and expressions and solve equations containing radical terms.

***ALII.13** The student will perform arithmetic operations with complex numbers.

***ALII.14** The student will identify and graph the equation for a parabola, circle, ellipse, and hyperbola.
Descriptive Statement: Study may be restricted to those parabolas with the axis parallel to the y-axis and circles, ellipses, and hyperbolas whose centers are located at the origin. A more extensive study may be needed if additional cases are not covered in a higher level course.

ALII.15 The student will solve quadratic systems.
Descriptive Statement: Graphic and algebraic methods will be used.

ALII.16 The student will demonstrate an understanding of exponential and logarithmic functions.
Descriptive Statement: This will include definitions of fractional and negative exponents, exponential functions, logarithmic functions, and the basic properties of logarithms.

TRIGONOMETRY

Trigonometry may be offered as a separate course or incorporated into other courses. When trigonometry is taught as a part of Algebra II or Math Analysis, only the outcomes marked with * should be considered basics. When trigonometry is a separate one-semester course, all of the concepts could be included.

Although the concepts appear in some logical instructional sequence, it is recognized that sequencing of concepts will be at the discretion of the instructor. The listed outcomes are only a portion of the curriculum, and the teacher is encouraged to surpass them.

***T.1** The student will study the concepts of functions and relations.
Descriptive Statement: For continuity from Algebra II, the student will link algebraic functions and trigonometric functions together.

***T.2** The student will use the definitions of the trigonometric functions to find the values of the functions when given information about the sides of a right triangle.

***T.3** The student will find the values of the six trigonometric functions when given the degree measure of an angle.

***T.4** The student will find the measure of an angle when given a value of a trigonometric function.

***T.5** The student will use the definitions of the trigonometric functions to find the unknown measures of sides and angles when given information about a right triangle.

T.6 The student will use degree and radian measure.
Descriptive Statement: Conversion from one measure to the other will be included.

T.7 The student will find the equation when given the graph of a trigonometric or circular function.
Descriptive Statement: Graphs may be presented in degree or radian measure.

T.8 The student will use the unit circle definitions.
Descriptive Statement: A real world situation will be presented in which one variable repeats its values periodically as the other increases.

***T.9** The student will sketch the graph of the six trigonometric functions.
Descriptive Statement: The student will state the domain and range of each.

T.10 The student will find angular and linear velocities and distances.
Descriptive Statement: A real world situation involving rotary motion will be presented.

***T.11** The student will use the fundamental trigonometric identities to rewrite a given trigonometric expression in terms of a specified trigonometric function using the same argument.
Descriptive Statement: The student will use sum and difference identities, half-angle identities, double angle formulas, etc.

T.12 The student will write the equation for the inverse functions and inverse relations and sketch the graphs.
Descriptive Statement: The student will be able to state the domain and range of the inverse functions and relations.

***T.13** The student will evaluate or transform to a simpler form an expression containing inverse circular functions.

***T.14** The student will solve triangles using the Law of Sines and the Law of Cosines.

***T.15** The student will find the area of a triangle.
Descriptive Statement: The student will be given the measure of two sides and the included angle or the measure of all three sides of the triangle.

T.16 The student will use vectors as mathematical models of quantities that have both magnitude and direction.
Descriptive Statement: The student will add vectors.

T.17 The student will solve real world problems involving the measurement of triangles.

T.18 The student will sketch the graph of a polar equation.
Descriptive Statement: The polar coordinate system will be used.

T.19 The student will transform an equation in polar coordinates to an equation in Cartesian coordinates and vice versa.

T.20 The student will perform operations with complex numbers in polar form.

MATH ANALYSIS

A course in Math Analysis may be offered for one or two semesters. The basic one-semester course should cover at least the outcomes marked with *. A two-semester course should cover all of the outcomes listed. If a separate course in trigonometry is not offered, a two-semester math analysis course should cover at least the basic content included in trigonometry and math analysis.

The teacher should vary the content and order of presentation to fit the needs of the students. The listed outcomes are only a portion of the curriculum, and the instructor is encouraged to surpass them.

***MA.1** The student will use different methods to represent relations and functions.
Descriptive Statement: Methods may include graphs, equations, and sets of ordered pairs.

***MA.2** The student will identify relations and functions.

***MA.3** The student will identify standard, point-slope, slope-intercept forms of linear equations.
Descriptive Statement: Changing from one form of equation to another will be included.

MA.4 The student will solve problems involving linear equations.
Descriptive Statement: Problems may involve parallel and perpendicular lines, angles between intersecting lines, distance from a point to a line and the bisector of an angle.

***MA.5** The student will demonstrate a knowledge in deriving an equation and sketching the graph for a conic section.
Descriptive Statement: Conic sections will include circles, ellipses, parabolas, hyperbolas, and the degenerage cases, point and line.

***MA.6** The student will demonstrate the ability to solve and graph higher degree equations utilizing synthetic division, Remainder and Factor Theorems, Descartes' Rule of Signs, and approximation of roots.
Descriptive Statement: Isolation and approximation of roots may be accomplished by iteration and/or Newton's method.

***MA.7** The student will demonstrate the ability to identify and solve for the nth term in both arithmetic and geometric sequences and series.

***MA.8** The student will demonstrate the ability to find the sum of a finite or infinite series.

***MA.9** The student will identify convergent and divergent series.
Descriptive Statement: The ratio test and comparison test may be used.

***MA.10** The student will develop an intuitive concept of limit through the application of sequences and series.

***MA.11** The student will demonstrate the ability to apply mathematical induction to verify and validity of certain formulas of sequences and series.
Descriptive Statement: An example is the Binomial Theorem to the nth degree.

***MA.12** The student will demonstrate the ability to solve problems involving permutations, combinations, and probability.

***MA.13** The student will write polar coordinates as rectangular coordinates and vice versa.

***MA.14** The student will graph simple polar equations.

***MA.15** The student will change an equation in polar coordinates to an equation in rectangular coordinates and vice versa.

MA.16 The student will demonstrate the ability to compute with complex numbers.
Descriptive Statement: Finding roots, products, quotients, and powers will be included.

MA.17 The student will demonstrate the ability to graph circular functions and find values on a unit circle.

MA.18 The student will demonstrate a knowledge of exponents and logarithms.

***MA.19** The student will demonstrate the ability to represent vectors in a coordinate plane.

***MA.20** The student will demonstrate the ability to find the resultant of two vectors.

CALCULUS

This is a basic one-year course and is not intended to replace college calculus. Although the concepts appear in some logical instructional sequence, it is recognized that sequencing of concepts will be at the discretion of the instructor. The listed outcomes are only a portion of the curriculum, and the teacher is encouraged to surpass them.

C.1 The student will apply the definition of a function including the relationship between the domain and range of a function.

C.2 The student will apply the definition and concept of a limit.

C.3 The student will evaluate limits.

C.4 The student will apply the definition of a derivative.

C.5 The student will demonstrate the ability to derive rules for the differentiation of algebraic functions.

C.6 The student will apply the chain rule.

C.7 The student will apply implicit differentiation.

C.8 The student will apply rules for the differentiation of algebraic functions.
Descriptive Statement: Problems to be considered are related areas, maxima and minima, and curve sketching. Maxima and minima problems will involve testing critical points and use of the second derivative.

C.9 The student will demonstrate the ability to derive rules for differentiation of transcendental functions.
Descriptive Statement: The functions to be considered are the number e, natural logarithms, trigonometric functions, and the inverse trigonometric functions.

C.10 The student will apply rules for the elementary forms of integration.
Descriptive Statement: All functions listed under differentiation will be included.

C.11 The student will apply the purpose of and the uses for the constant of integration.

C.12 The student will evaluate definite integrals.

C.13 The student will demonstrate a knowledge of integration as the result of the process of summation.

C.14 The student will solve problems involving applications of integration.
Descriptive Statement: Types of problems to be emphasized are the area under plane curves, volume of solids of revolution, the area of a surface of revolution, and work problems.

C.15 The student will demonstrate a knowledge of the Mean Value Theorem.